

MATERIAL GROUP 001 AGGREGATES

Inspection Procedures

Aggregates are preliminarily accepted at the source based on quality and gradation testing.

Quality

Quality approval is based on a series of samples taken by District Bureau of Materials inspectors and tested by the Bureau of Materials & Physical Research.

Gradation

Gradation approval is by District Bureau of Materials gradation tests of processed products according to the manual for aggregate inspection or by the Bureau of Materials & Physical Research Policy Memorandum "Aggregate Gradation Control System (AGCS)" found in the Bureau of Materials & Physical Research *Manual of Test Procedures for Materials*.

Acceptance

Aggregate is accepted from sources appearing on the approved list of aggregate sources. Evidence of acceptance is by tickets from an approved source indicating producer, and IDOT gradation. The producer should also be encouraged to specify the contract information on the ticket.

MATERIAL GROUP 100 BITUMINOUS MATERIALS

Inspection Procedures

Bituminous materials are accepted by certification from producers whose production has been certified according to the Bureau of Materials & Physical Research Policy Memorandum "Asphalt Cement, Cutback Asphalt, and Road Oil Acceptance Procedure".

Most materials in this group are taken by certification with periodic sampling and testing by the Bureau of Materials & Physical Research as noted in Articles 100.1.1, 100.1.2, and 100.1.3 herein. When samples are obtained from storage tanks or lines with a sampling valve or spigot, always let an appropriate amount of material run out to clear the line before collecting samples.

Asphalt Cements, Road Oils, and Liquid Asphalt

Refer to Part 2 (Material Codes, Specifications, and Acceptance Methods) herein for sample sizes, etc. Most material is covered in the IDOT Standard Specifications and AASHTO. Viscosity-graded asphalt cements are under Article 1009.05 of the Standard Specifications. Periodic check samples may be taken from the job site.

Emulsified Asphalts

Most emulsion specifications are listed under Article 1009.07 of the Standard Specifications. Most producers are certified under the Bureau of Materials & Physical Research Policy Memorandum "Emulsified Asphalt Acceptance Procedure". Routine check samples at destination should be avoided unless the material is suspect.

Bases and Diluents

All materials under this group are used to blend finished products. There is no need to sample any of these materials outside the refinery.

MATERIAL GROUP 175 BITUMINOUS MIXTURES

Section 175.1 Inspection Procedures

Bituminous mixes shall conform to Section 404, 405 or 406 of the Standard Specifications and to the current Special Provisions for QC/QA of Bituminous Concrete Mixtures.

Article 175.1.1 Acceptance

Acceptance of Bituminous Mixtures is accomplished by testing at the batch plant to verify compliance to mix designs.

(a) QC/QA Projects

On QC/QA projects, mix design verification tests are performed by producer personnel with Quality Assurance testing and verification by IDOT district personnel.

(b) Non QC/QA Projects

Mix design verification testing is performed by other than producer personnel on these projects.

MATERIAL GROUP 200
CASTINGS (FRAMES, GRATES & LIDS)

Inspection Procedures

Castings are accepted on the basis of manufacturers certification and a visual inspection for condition and contract compliance.

Gray iron and ductile iron castings shall conform to Articles 1006.14 and 1006.15, respectively, of the Standard Specifications and to the respective standards and specifications indicated in Part 2 (Material Codes, Specifications, and Acceptance Methods) herein. Basic inspection procedure for castings is summarized in the following articles.

NOTE: Domestic Steel Products Act applies. (See Article 106.1 of the Standard Specifications.)

Type, Size, and Number

Determine the type, size, and number of castings to be inspected. Usually you can get this information from the following:

- Contract and plans
- Contractor's order

Highway Standard

Check the Highway Standards for a drawing of the type of casting to be inspected.

Manufacturer's Certificate of Compliance

The inspector shall obtain a manufacturer's certificate of compliance.

Visual Inspection

Make a visual inspection which includes the following:

- Look at the casting to see that it is the right type (as compared to the appropriate drawing).
- Check physical dimensions by measurement to establish that it is correct size.

**MATERIAL GROUP 200
CASTINGS (FRAMES, GRATES & LIDS)**

Frames, Grates, and Lids

Gray Iron Castings

The inspection of gray iron castings is primarily a visual inspection. The inspector should look for the casting to be free from cracks, fused-on sand, runners, risers, and other cast-on pieces. The casting should be relatively smooth. The tensile strength of gray iron is approximately 207 to 310 MPa (30-45 ksi).

(a) Physical Dimensions

Checking the physical dimensions requires measuring the casting for substantial conformance to the Highway Standard drawing or the specified special drawing.

(b) Weight of Casting

When adequate facilities are available, a random sampling (1 in 50) of the casting may be weighed. The required weight is given on the Highway Standard drawing.

Ductile Iron Castings

The inspection of ductile iron castings should follow the procedure set forth for gray iron castings. Ductile iron has a higher strength and ductility than gray iron. The tensile strength ranges from approximately 414 to 828 MPa (60-120 ksi). Ductile iron is allowed to be used primarily in the lids and grates.

(a) Physical Dimensions

Follow the procedure for gray iron castings.

(b) Weight of Casting

Follow the procedure for gray iron castings.

**MATERIAL GROUP 215
PORTLAND CEMENT CONCRETE**

Inspection Procedures

Portland Cement Concrete conforms to section 1020 of the Standard Specifications and the current Special Provisions for "QC/QA for Concrete Mixtures".

Acceptance

Acceptance of PC Concrete is accomplished by observation and testing at an approved batch plant or ready mix plant to verify proper ingredients and proportioning methods. Tests to verify air entrainment, slump and strength are usually performed at the job site according to "The Manual of Test Procedures for Materials" and the "Project Procedures Guide".

(a) **QC/QA Projects**

Quality Control testing is performed by contractor personnel with Quality Assurance testing by IDOT personnel according to the Special Provisions for QC/QA Concrete Mixtures.

MATERIAL GROUP 250
CONCRETE MASONRY UNITS AND MISCELLANEOUS PRECAST

Inspection Procedures

It is essential that the inspector obtain applicable ASTM or AASHTO specifications; the Bureau of Materials & Physical Research Policy Memorandum "Quality Control/Quality Assurance Program for Precast Concrete Products"; related specifications from the IDOT Standard Specifications; and Design Standards to assist in inspection and acceptance procedures. The inspection for precast concrete products consists of production quality control by the producer and periodic post-production quality assurance by the inspector.

Pre-production controls consist of assuring that all component materials meet the appropriate specifications and that the producer meets his responsibilities, while post-production inspection involves physical tests and visual inspection on the finished product.

A patching procedure is contained in the Bureau of Materials & Physical Research Policy Memorandum "Quality Control / Quality Assurance Program for Precast Products". Information relative to product requirements, sample sizes, and acceptance procedures is contained in Part 2 (Material Codes, Specifications, and Acceptance Methods) herein.

Material Requirements

It is the responsibility of the producer to obtain component materials (cement, aggregate, reinforcement steel, and admixtures) that meet the required specifications. The sources of all component materials shall be approved by IDOT. It is the responsibility of the inspector to periodically sample all component materials and submit these samples to the Bureau of Materials & Physical Research for testing.

(a) **Cement and Aggregates**

Cement and aggregates shall have documentation as to their acceptance in the form of delivery tickets from an approved source. The producer shall keep

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CONCRETE MASONRY UNITS AND MISCELLANEOUS PRECAST

this documentation on file so that the inspector can periodically review the documentation.

(b) Steel Reinforcement

Steel mesh reinforcement shall be accepted only from Certified Plants as stated in the Bureau of Materials & Physical Research Policy Memorandum "Reinforcement Fabric Plant Certification Procedure". Reinforcement bars are to be accepted only from Certified Plants as stated in the Bureau of Materials & Physical Research Policy Memorandum "Reinforcement Bar and/or Dowel Bar Plant Certification Procedure". Current listings of Certified Plants are on file in each District office.

Note: Domestic Steel Products Act applies. (See Article 106.01 of the Standard Specifications.)

Plant Requirements

Each producer must meet the following requirements.

(a) Testing Equipment

Each producer is required to have testing equipment, or have a source available, for performing compression tests on cores and cylinders.

(b) Product Storage and Shipment

Each producer must have adequate and accessible storage in which to properly store the finished product awaiting inspection and/or shipment. The storage area should be free of mud and/or weeds and be arranged in such a manner as to permit the inspector freedom of access. When the concrete has attained the required strengths, but not prior to 4 days after casting, the units may be loaded, shipped, and used.

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CONCRETE MASONRY UNITS AND MISCELLANEOUS PRECAST

Concrete Masonry Units

The inspection process for concrete masonry units is limited to a visual inspection with cores to be taken or test cylinders to be made periodically for compressive and absorption tests.

Visual Inspection

During the visual inspection phase, the inspector shall check each unit for the following features.

(a) Identification Marks

Identification marks shall be either etched, painted, or stamped with waterproof marking. A typical example of the following markings may be "[producer name] 5/21/96 M 199". (See Figure 25 in Appendix B herein.)

- Name or trademark of producer
- Identification of the plant (such as plant number)
- Date of manufacture
- ASTM/AASHTO Designation

(b) Physical Measurements

- Internal diameter (Tolerances are specified in the appropriate ASTM or AASHTO specification.)
- Length (Tolerances are specified in the appropriate ASTM or AASHTO specification.)
- Wall thickness (Tolerances are specified in the appropriate ASTM or AASHTO specification.)
- Straightness (All tolerances are specified in the appropriate ASTM or AASHTO specification.)

MATERIAL GROUP 250
CONCRETE MASONRY UNITS AND MISCELLANEOUS PRECAST

Defects

In addition to checking for the above features, each unit is checked for the following defects or impairments during the visual inspection phase. The referenced Figures are in Appendix B (Part 3) herein.

(a) Improper Reinforcement Placement

A thin layer of concrete over the steel may be evidenced by ghosting. Further inspection may be necessary to determine the proper depth of cover as stated in the appropriate specification. The exposure of ends of longitudinal steel, stirrups, lift holes, or spacers used to position the reinforcement (cages) during placement of the concrete is not considered a defect or cause for rejection. Any other exposed steel is considered a defect and is rejected.

(b) Chipped or Broken Ends

Remove of all loose material, cutting the area back until the coarse aggregate will break under chipping rather than dislodging. The sides of the area to be patched shall be shaped with one or more faces having a minimum depth of ½ inch as perpendicular as possible to the surface of the area. The patch shall be cured according to the Specifications. If a patch mix or grout is used, the patch shall be cured according to the manufacturer's recommendations. Aggregates may be used in the patch mix as recommended by manufacturer.

(c) Patching

Defects inside or outside the unit may also be patched provided the cross-sectional area of the patch does not exceed 2 percent of the cross-sectional area of the pipe and 1/2 percent of the surface area of the pipe. No more than 1 patch per piece of pipe is permitted. All patching shall be done according to and with the pipe manufacturer's approved methods and patching materials.

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(d) Cracks or Fractures

These are considered cause for rejection if they pass through the wall. A single end crack that does not extend into the barrel of a unit is not a cause for rejection. Any crack having a surface width of 0.25 mm (0.01 in.) or more is considered cause for rejection. (See Figures 6 in Appendix B herein.)

(e) Out-of-round

Out-of-round (not of uniform diameter) is cause for rejection.

(f) Honeycomb

If it is not deeper than 3/4 of the depth of the coarse aggregate and does not exceed 5 percent of the circumferential area of the unit, it may be considered acceptable. However, no unit is acceptable if the honeycomb is on the inside of the unit.

(g) Barrel Roughness

The inside of the unit should be substantially free from surface roughness.

Rejection

To assist in making decisions during the visual inspection phase, a number of photographs illustrating various reasons for rejection have been included in Appendix B (Part 3) herein.

Each example is identified with an appropriate caption. In some of the illustrations the defect shown is not sufficient cause for rejection and is identified accordingly. Below is a tabular summary of reasons for rejection, most of which are illustrated in Appendix B.

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CONCRETE MASONRY UNITS AND MISCELLANEOUS PRECAST**

<i>Cause for Rejection</i>	<i>Possible Repair</i>
Fail physical test requirements	None
Chipped or broken ends	Patch if not too large
Improper reinforcement placement	None
Excessive honeycomb	None
Insufficient wall thickness	None
Poor workmanship (roughness, etc.)	None
Improper diameter or length	None
Out-of-round	None
Excessive cracks for fractures	None

Evidence of Acceptance

Refer to Bureau of Materials & Physical Research Policy Memorandum "Quality Control/Quality Assurance Program for Precast Concrete Products" for requirements of Certified Plants. Certified Plant producers will be stamping the products with the word "CERTIFIED". However, products from a De-Certified Plant will be inspected, tested, and stamped "ILL OK" by an IDOT inspector. Each pipe should be stamped on one end. The stamp serves as evidence of inspection. Shipment is followed with an inspection report.

Precast Bridge Beams

Precast concrete bridge beams shall be made according to the provisions of Articles 504.05 and 504.06 of the Standard Specifications and the Bureau of Materials & Physical Research Policy Memorandum "Quality Control/Quality Assurance Program for Precast Concrete Products".

MATERIAL GROUP 275
PRESTRESSED & POSTTENSIONED CONCRETE BRIDGE BEAMS

Inspection Procedures

Article 504.06 of the Standard Specifications and the *Manual for Inspectors of Precast Prestressed Concrete Products* are the necessary documents for materials and fabrication inspection. Part 2 (Material Codes, Specifications, and Acceptance Methods) herein provides additional inspection data.

Inspection of prestressed concrete items consists of Production Quality Control by the Producer and Quality Assurance by IDOT inspectors at the production facility. The prestress manual details inspection requirements and minimums.

Evidence of Acceptance

All acceptable prestress products should be clearly stamped with the inspector's "ILOK" stamp.

MATERIAL GROUP 300 ELECTRICAL CABLE & CONDUIT

Inspection Procedures

Prior to performing the inspections and/or reporting of electrical materials, the specific contract should be checked for special provisions or allowances that may be included. Physical properties of materials, such as electrical cable, conduit, and fittings, can be measured, counted, and given a visual inspection.

Inspection standards, specifications, and tolerances are covered in the applicable sections of AASHTO, NEMA, ANSI, and ASTM specifications; the Standard Specifications; and the contract plans and/or special provisions.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications.)

Electrical Cable

Acceptance of electrical cable is by visual inspection at the job site or supplier's location by district personnel.

Electrical cable should be inspected on reel lots when possible. Conductor size should be measured by micrometer, and the number of conductors in stranded wire counted. Specific data can be found in ASTM B 3M, B 8M, B 33M, and B 189M. Insulation type, thickness, color, and markings should be examined and compared to requirements of Articles 873.01 and 1076.04 of the IDOT Standard Specifications.

Conduit and Fittings

Acceptance of conduit is by visual inspection at the job site or supplier's location by district personnel

Conduit and fittings should be inspected according to Article 1088.01 of the Standard Specifications. Wall thickness should be measured with a micrometer, and the galvanizing should be measured with a microtest gauge. Samples may periodically be taken by the inspector for testing by the Bureau of Materials & Physical Research.

MATERIAL GROUP 300 ELECTRICAL CABLE & CONDUIT

Tether Wire and Span Wire

Tether wire and span wire shall be examined for a diameter and number of strands and for compliance with Article 1076.03 of the Standard Specifications. Samples shall be taken and submitted to the Bureau of Materials & Physical Research for testing. Information relative to sample size and frequency is contained in Part 2 (Material Codes, Specifications, and Acceptance Methods) herein.

Unit Duct

Unit duct should be inspected according to Article 1066.01 of the Standard Specifications and for contract and plan compliance.

Cable shall be inspected by District personnel according to Article 300.1.1 herein. The inspector should verify that the duct is labeled with the proper NEMA or NEC markings according to Article 1088.01(c) or 1066.01.

Standard Definitions of Terms Relating to Wire

Tether Wire

Tether wire shall be 6.00 mm (1/4 in.) nominal diameter, seven-strand, zinc-coated wire conforming to ASTM A 475M, High Strength Grade or better.

Span Wire

Span wire shall be 9.00-mm (3/8-in.) nominal diameter, seven-strand, zinc-coated wire conforming to ASTM A 475M, Utilities Grade or better.

MATERIAL GROUP 330 LIGHT & SIGNAL COMPONENTS

Inspection Procedures

Above-ground light and signal components are included in this material group. Inspection standards and specification dimensions and tolerances for these components may be found in Sections 700, 800, 1000, and 1100 of the Standard Specifications, contract plans, special provisions, and shop drawings. These materials can be measured, counted, and given a visual inspection by the District Materials inspectors, District Traffic personnel, or the District Construction personnel.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 Standard Specifications.)

Light & Signal Posts, Poles, and Mast Assemblies

These materials should be inspected for conformance with shop drawings and specifications approved by the District Traffic section and/or District Electrical section. Special attention should be directed to welded and slip fit joints. Should a question arise concerning joints, the Bureau of Bridges & Structures can lend assistance. Galvanized products should be checked for minimum coating thickness with a thickness gauge.

Service Installations

Service installations may be inspected at the site of assembly or on the job site. They should conform to Section 800 of the IDOT Standard Specifications.

**MATERIAL GROUP 350
LUMBER & TIMBER PRODUCTS**

Inspection Procedures

Inspection of both treated and untreated products (except untreated native timber piling) and the preservatives shall comply with the current Bureau of Materials & Physical Research Policy Memorandum "Inspection Procedures and Approved Inspection Agencies for Timber and Preservative-treated Timber Products" and with Section 1007 of the Standard Specifications.

MATERIAL GROUP 365 PILING

Inspection Procedures

The presentation of piling products is divided into three categories: timber piling, metal piling, and concrete piling.

Untreated timber piling that is in conformance with the specifications shall be branded with the inspector's hammer. Evidence of conformance to the specifications for metal and concrete piling may consist of an "ILL OK" stamp or a green tag.

An LA-15 ticket, with all pertinent data listed, may be issued.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications.)

Timber Piling

The procedures for inspection of timber piling are covered under Material Group 350 "Lumber & Timber Products". However, the material codes for timber piling with pertinent inspection information are listed under this material group (365) in Part 2 (Material Codes, Specifications, and Acceptance Methods) herein.

Inspection of treated and untreated piling and preservatives shall comply with the current Bureau of Materials & Physical Research Policy Memorandum "Inspection Procedures and Approved Inspection Agencies for Timber and preservative-treated Timber Products". Untreated native timber piling may be inspected at the source or destination by an IDOT inspector.

MATERIAL GROUP 365 PILING

Metal Piling

The primary aspect of inspection of metal shell, sheet, and H-beam piling revolved around visual inspection, determination of workmanship, and physical dimensions.

It is the responsibility of the supplier or contractor to furnish a certification of the mill analysis for the proper heat numbers. The visual inspection should include determination of the following:

- Heat numbers which should be painted or stamped on each piece.
- The gauge of the material is to be determined with a micrometer; in the case of metal shell piling, it may be necessary to use a micrometer with the feeler tips milled down to a point.
- General appearance and condition of any welds such as on spirally welded metal shell piling.
- Physical dimensions.
- General surface condition.
- Condition of the channel locks on sheet piling.

The majority of steel for piling is taken on certification. However, when it is necessary to sample for tests, refer to Part 2 (Material Codes, Specifications, and Acceptance Methods) herein for sampling and acceptance procedures.

MATERIAL GROUP 365
PILING

(a) Steel Shell

Steel shell piling is to be in compliance with Article 1006.05(a) of the Standard Specifications. Metal shell for cast-in-place concrete piles is to be in compliance with Article 512.04 of the Standard Specifications.

(b) Steel Sheet

Steel sheet piling is to be in compliance with Article 1006.05(b) of the Standard Specifications.

(c) Steel H

Steel H piling is to be in compliance with Articles 512.05 and 1006.04 of the Standard Specifications. Storage and handling are to be according to Article 505.08(c) of the Standard Specifications.

Concrete Piling

Precast and prestressed concrete piling is usually fabricated at a plant that produces several different concrete products. The techniques of the fabrication, forms, tensioning, mix design, compressive strength, curing, storage, and transportation requirements are given in Section 504 of the Standard Specifications and in the *Manual for Inspectors of Precast Prestressed Concrete Products*.

(a) Precast

Precast piling shall be in compliance with Articles 512.03(a) and (c) and with the applicable requirements of Section 504 of the Standard Specifications and inspected as per Bureau of Materials & Physical Research Policy Memorandum "Quality Control/Quality Assurance Program for Precast Concrete Products".

**MATERIAL GROUP 365
PILING**

(b) Prestressed

Prestressed piling shall be in compliance with Articles 512.03(b) and (c) of the Standard Specifications. Tensioning and curing procedures shall be as outlined in the applicable parts of the Standard Specifications and of the *Manual for Inspectors of Precast Prestressed Concrete Products*.

(c) Evidence of Acceptance

All acceptable prestress concrete piling should be clearly stamped with the inspector's "ILOK" stamp.

Acceptable precast piling should be stamped "CERTIFIED": by the producer's representative.

MATERIAL GROUP 375
PORTLAND CEMENT & OTHER CEMENTITIOUS MATERIALS

Inspection Procedures

Reference to Part 2 (Material Codes, Specifications, and Acceptance Methods) herein will provide basic inspection and sampling procedures.

Portland Cement

Portland cements include all types under Article 1001.01 of the Standard Specifications. These cements are accepted from plants whose production is evaluated by IDOT according to the Bureau of Materials & Physical Research Policy Memorandum "Portland or Blended Cement Acceptance Procedure for Qualified and Non-Qualified Plants". Random samples are required as directed by memo from the Bureau of Materials and Physical Research.

Finely Divided Minerals Used in Portland Cement Concrete and Other Applications

Fly ash, ground granulated blast furnace slag, microsilica, and high-reactivity metakaolin are accepted from plants whose production is evaluated by IDOT according to the Bureau of Materials & Physical Research Policy Memorandum "Acceptance Procedure for Finely Divided Minerals Used in Portland Cement Concrete and Other Applications".

(a) Fly Ash

Fly ash is a finely divided by-product that results from the combustion of ground or powdered coal. It is accepted from sources approved by the Bureau of Materials & Physical Research. A list of certified sources is available from the Bureau of Materials & Physical Research or the District Bureau of Materials.

(b) Slag – Ground Granulated Blast Furnace

Ground granulated blast furnace (GGBF) slag is a glassy granular material formed when molten blast furnace slag is rapidly chilled, which is ground to a portland cement fineness. It is accepted from sources approved by the Bureau of Materials & Physical Research. A list of certified sources is

MATERIAL GROUP 375
PORTLAND CEMENT & OTHER CEMENTITIOUS MATERIALS

available from the Bureau of Materials & Physical Research or the District Bureau of Materials.

(c) Microsilica

Microsilica is an amorphous silica of high silica content and purity possessing high pozzolanic activity. It is accepted from sources approved by the Bureau of Materials & Physical Research. A list of certified sources is available from the Bureau of Materials & Physical Research or the District Bureau of Materials.

(d) High-Reactivity Metakaolin

High-reactivity metakaolin (HRM) is a reactive aluminosilicate pozzolan formed by calcining purified kaolinite at a specific temperature range. It is accepted from sources approved by the Bureau of Materials & Physical Research. A list of certified sources is available from the Bureau of Materials & Physical Research or the District Bureau of Materials.

MATERIAL GROUP 380 WATERPROOFING

Inspection Procedures

Inspection procedure requires sampling and testing of the materials. For all practical purposes, the waterproofing materials are confined to three systems, those being general construction waterproofing, bridge deck waterproofing, and reflective crack control. Information relative to specification requirements, sample sizes, and acceptance procedures is contained in Part 2 (Material Codes, Specifications, and Acceptance Methods) herein. Samples are usually obtained by district personnel and tested by the Bureau of Materials and Physical Research.

General Construction Waterproofing Materials

See Section 1060 of the Standard Specifications.

Bridge Deck Waterproofing Materials

See Section 1061 of the Standard Specifications.

Reflective Crack Control Materials

See Section 1062 of the Standard Specifications.

Fiber Glass Fabric Repair System

See Section 1063 of the Standard Specifications.

MATERIAL GROUP 400 PAINTS & PAINT MATERIALS

Inspection Procedures

The paints and raw materials covered in this material group are normally sampled at the paint manufacturer's plant. As a general guide to sampling these materials, the inspector should refer to ASTM D 3276D "Guide for Paint Inspectors" and ASTM E 300D "Practice for Sampling Industrial Chemicals". The testing of materials in this material group is done by the Bureau of Materials & Physical Research. Traffic marking paint is usually sampled at the manufacturer's plant by Bureau of Materials & Physical Research personnel.

Raw Materials

When the paint to be manufactured is based on a composition type specification, the ingredient materials should be sampled and tested. Refer to Part 2 (Material Codes, Specifications, and Acceptance Methods) herein for sample size.

Finished Paint

Finished paint can be sampled from either storage tanks prior to filling or during the filling operation. However, if the material has already been packaged, the inspector should then select two containers at random from each batch for sampling. Before drawing a sample, the contents of the container must be thoroughly mixed, making certain that any settled portion is fully dispersed. It is important to seal the sample container immediately with a tight cover to prevent the loss of volatile solvents. Refer to Part 2 (Material Codes, Specifications, and Acceptance Methods) herein for sample size.

The inspection should also ensure that the containers are filled to the correct capacity, properly sealed, and labeled. The label should show the manufacturer, type of material, specification number, batch number, and date of manufacture.

Pavement Marking Paint

Pavement marking paint shall meet the provisions of Article 1095.02 of the Standard Specifications. Each batch or lot of paint and glass beads is sampled at the production facility and tested by the Bureau of Materials & Physical Research.

**MATERIAL GROUP 400
PAINTS & PAINT MATERIALS**

A printout of approved lots is issued weekly to each District Materials office. Acceptance is based on approved lots.

Acceptance

Acceptance of paints is by approved lots or batches. A list of approved lots is maintained by the Bureau of Materials and Physical Research Chemistry Laboratory and is available at the District Bureau of Materials.

MATERIAL GROUP 420 CHEMICALS

Inspection Procedures

The materials covered in this material group include a wide variety of chemical compounds. Inspection usually involves sampling the material and submitting the samples to the Bureau of Materials & Physical Research. However, for some items, such as concrete admixtures and asphalt additives, the Bureau of Materials & Physical Research maintains a current list of approved products that can be accepted.

Concrete Admixtures and Membrane Curing Compounds

The concrete admixture group includes the air-entraining, water-reducing, retarding, and accelerating chemicals specified in Section 1021 of the Standard Specifications. A preliminary sample must be sent to the Bureau of Materials & Physical Research by the manufacturer along with the CCRL test results and a certification that no changes have been made in the formulation of the material since the performance of the CCRL test. After the product has been tested and approved by the Bureau of Materials & Physical Research, acceptance of the material will be based on a list of approved sources.

Membrane curing compounds are usually sampled by the inspector at the source for unassigned stock. The inspection process consists of sampling batches (lots) and submitting the samples to the Bureau of Materials & Physical Research for testing. Acceptance of the material will be based on approved lots. Refer to Section 1022 of the Standard Specifications.

Asphalt Additives

Asphalt additives covered in this article are coating and anti-stripping agents meeting the IDOT Bureau of Materials & Physical Research M 38-95 specification. The Bureau of Materials & Physical Research supplies a list of products that have been approved for maintenance mixtures. No sampling is necessary.

Miscellaneous Chemicals

The miscellaneous chemicals in this group include such items as water, sign stripper, and protective coat. Refer to Part 2 (Material Codes, Specifications, and Acceptance Methods) herein for information on sample size, etc.

MATERIAL GROUP 420 CHEMICALS

Chemical Adhesives

Preliminary samples of chemical adhesives are tested by the Bureau of Materials & Physical Research for approval. These materials shall be according to Section 1027 of the Standard Specifications. A list of approved adhesives is supplied. Adhesives on the list may be accepted for the use indicated without further sampling. Special attention should be paid to proper mixing.

Epoxy Resins

Epoxy resins are covered in Section 1025 of the Standard Specifications and Bridge Special Provisions. They are accepted on the manufacturer's certificate of compliance to ASTM C 881. The inspector shall verify that the type, grade, and class are being used for the appropriate application.

MATERIAL GROUP 450 CORRUGATED STEEL PIPE

Inspection Procedures

The base metal for products included in this material group is sheet steel or structural plate which has subsequently been treated with a metallic coating consisting of either a zinc or an aluminum alloy. Precoated and bituminous-coated items have also been listed since, in addition to a metallic coating, the base metal may be further protected and its life cycle extended by the application of either a polymeric or bituminous coating material. The inspection process must therefore include the base metal, its metallic coating, and any additional coating material that may be required.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications.)

Inspection standards for the production, fabrication, and subsequent acceptance of corrugated steel pipe, structural plate, and related accessories are covered in the applicable sections of the Standard Specifications, AASHTO and ASTM specifications, and the contract plans and/or special provisions. Primary specification references are as follows:

- AASHTO M 36M, Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
- AASHTO M 167M, Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe Arches, and Arches
- AASHTO M 190M, Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
- AASHTO M 218M, Steel Sheet, Zinc-Coated (Galvanized), for Corrugated Steel Pipe
- AASHTO M 245M, Corrugated Steel Pipe, Polymer-Precoated, for Sewers and Drains
- AASHTO M 246M, Steel Sheet, Metallic-Coated and Polymer-Precoated, for Corrugated Steel Pipe

MATERIAL GROUP 450 CORRUGATED STEEL PIPE

- AASHTO M 274M, Steel Sheet, Aluminum-Coated (Type 2), for Corrugated Steel Pipe
- IDOT *Standard Specifications for Road & Bridge Construction*
 - ⇒ Section 541, "Corrugated Structural Plate Drain Structures"
 - ⇒ Section 542, "Pipe Culverts"
 - ⇒ Section 550, "Storm Sewers"
 - ⇒ Section 601, "Pipe Drains, Underdrains, and French Drains"
 - ⇒ Section 1006, "Metals"

(a) Acceptance

Acceptance of corrugated steel pipe is based upon verification of proper steel and coating as well as visual inspection of fabrication and condition. The inspection can take place at the production site or the job site. Pipe inspected at the production site should be stamped with the inspectors "ILOK" stamp or accompanied by an LA15.

Corrugated Steel Pipe

The inspector shall be furnished an itemized list indicating the sizes, lengths, gauges, coating, special treatments when required, and accessories for all products that are requested to be inspected. The products must be easily accessible so that a complete visual and dimensional examination can be made.

The following items are specific areas that the inspector should check during the inspection process and compare with the appropriate references.

(a) Marking

An identification stamp shall be every 0.6 to 1.5 to 2 meters (2-5 ft.) on sheet in coils or cut lengths and on each metal plate. Mixing of brands of the same base metal with the same coating thickness is permitted for galvanized corrugated steel culvert pipe.

MATERIAL GROUP 450
CORRUGATED STEEL PIPE

(b) Dimensions

Check for compliance with appropriate tolerances described below.

(1) Thickness

Flat sheet material shall be measured at any point not less than 9 mm (3/8 in.) from an edge. Corrugated products are to be measured on the tangents of the corrugations. Assure gauge of metal conforms to the type requirements for pipe size and gauge in the Standard Specifications.

(2) Diameter

Diameter shall be measured on the inside crest of the corrugations. Annular pipe diameters may, as an alternate, be measured in the valley of the outside circumference. This does not apply to helical pipe. Circular pipe and reformed pipe arch tolerances are based on nominal diameters. Tolerances for plate pipe are governed by both the equivalent diameter and corrugation size.

(3) Length

Length is measured as the net length of the finished product. Average length deficiency for pipe shipment shall not exceed 1 percent of lineal meter ordered.

(c) Corrugations

Corrugations shall form smooth, continuous curves and tangents and may be either annular, spiral, or a combination of both. IDOT Standard Specifications denote the corrugation sizes permitted for a specific diameter and type of pipe. The depth, pitch, and spacing of the corrugations should be checked along with the subsequent minimum lap width requirement of the finished product.

**MATERIAL GROUP 450
CORRUGATED STEEL PIPE**

(d) Rivets

The location, size, and number of rivets for corrugation of the longitudinal seam are based on the sheet thickness, corrugation size, and the diameter of the pipe. Circumferential seam rivets shall be of the same size as for longitudinal seams with a maximum 150-mm (6-in.) spacing, except that only 6 rivets will be required for 300-mm (12-in.) diameter pipe.

(e) Spot Weld

The location, size, and number of spot welds substantially comply with the rivet requirements.

(f) Lock or Welded Seams

For helically corrugated pipe, seams shall be continuous from end to end of each pipe length.

(g) Metallic Coating

The weight of coating is the total amount on both surfaces of the sheet expressed in grams per square meter (g/m^2) (oz./ sq. ft.). A magnetic type gauge can be used to check the weight of zinc coating. All coating shall adhere to the base metal such that no peeling occurs while the material is being corrugated and formed into the final product. Products having either bruised, scaled, broken, hair-checked, or blistered coating or having "white rust" (zinc oxide) shall be rejected. See Figures 1, 2 and 8 in Part 3, Appendix A herein. Bituminous-coated or paved products shall be checked for proper thickness areas.

(h) Workmanship

The completed products shall show careful, finished workmanship in all particulars. Following are some defects that indicate poor workmanship, and the presence of any or all of them in any individual item or generally in any shipment shall be sufficient cause for rejection.

MATERIAL GROUP 450 CORRUGATED STEEL PIPE

- Variation from a straight center line
- Elliptical shape in pipe intended to be round
- Dents or bends in the metal
- Metallic coating which has been bruised, broken, or otherwise damaged
- Lack of rigidity
- Illegible markings on the steel sheet
- Ragged or diagonally sheared edges
- Uneven laps in riveted or spot-welded pipe
- Loose, unevenly lined, or unevenly spaced rivets
- Defective spot welds or continuous welds
- Loosely formed lock seams

Some of the defects are show in the photographs in Part 3, Appendix A herein.

Miscellaneous

(a) Coupling Bands

Coupling bands shall be of the same metallic material as the pipes being connected. Specifications require that the bands shall provide sufficient strength to preserve alignment and prevent pipe separation or soil infiltration. The band may be 3 sheet thicknesses lighter than that used to fabricate the pipe but not less than 1.32 mm (0.052 in.) thick (AASHTO M 36M, Table 12). The widths and configurations for bands will vary for different diameters of pipes and for different styles or depths of corrugations.

Neither bituminous coating nor precoating will be required for connecting bands except when used in conjunction with either precoated fully lined pipe or arches; the bands shall then be precoated and be of the hugger or annular type.

MATERIAL GROUP 450
CORRUGATED STEEL PIPE

(b) Perforations

Perforations shall be approximately circular and clean cut, have a nominal diameter in accordance with the Standard Specifications, and be arranged in rows parallel to the axis of the pipe. Perforations shall be located on the inside crest or along the neutral axis of the corrugations. The rows of perforations and their locations are based on the diameter of the pipe as specified in AASHTO M 36M.

(c) End Finish

A reinforced end finish is not required on inlets nor outlets of corrugated steel pipe; however, when specified, it shall be finished in a satisfactory manner. Cut ends on helically corrugated pipe must be painted with zinc-rich paint.

(d) Specialty Items

Special pipe, perforated casings for stone wells, flumes, and pipe requiring a diameter not covered in the specifications shall meet the requirements of the plans or special provisions. The plans or special provisions governing these special items should be furnished the fabricator in order that the product can be properly constructed and subsequently inspected. Tees, angles, elbows, etc., should be fabricated by welding—not by riveting. An approved coating shall be applied after welding. Pipe having a diameter not covered in the specifications shall be of the same gauge and have the same lap as pipe of the nearest diameter in the specifications. If the diameter should be the same number of inches between diameters given in the specifications, the pipe should be fabricated in accordance with the larger diameter.

Handling

The field inspection made by the Engineer shall include an examination of detrimental defects of broken, peeled, and otherwise damaged coating caused by carelessness in handling. Proper care shall be exercised in loading, transporting, unloading, and delivering the finished product to the construction site and in its placement. When nesting or loading, boards or other suitable

MATERIAL GROUP 450
CORRUGATED STEEL PIPE

material running the full length of the product shall be used to prevent metal from rubbing or resting against metal and to prevent damage to the pipe.

Special care shall be exercised in preventing rivets or bolts from scratching the adjacent product. Chains or metal cables used in binding the load and unloading shall be encased to prevent damage, or suitable material shall be fastened securely between the product and chains or cable. Wood skids or other approved devices shall be used in loading and unloading. Metal lever bars will not be permitted in loading and unloading. Dragging the product across rocky ground or dragging in such manner as to cause gouging or removal of the coating will not be permitted.

MATERIAL GROUP 475 CONCRETE PIPE & DRAIN TILE

Inspection Procedures

It is essential that the inspector obtain applicable ASTM or AASHTO specifications. The Bureau of Materials & Physical Research Policy Memorandum "Quality Control/Quality Assurance Program for Precast Concrete Products"; related specifications from the Standard Specifications; and Design Standards to assist in inspection and acceptance procedures. The inspection process for concrete products is a combination of production quality control by the producer, component material inspection, and quality assurance inspection by the inspector.

Pre-production controls consist of assuring that all component materials meet the appropriate specifications and that the producer meets his responsibilities, while post-production inspection involves physical tests and visual inspection on the finished product.

Material Requirements

It is the responsibility of the producer to obtain component materials (cement, aggregate, reinforcement steel, and admixtures) that meet the required specifications. The sources of all component materials shall be approved by IDOT. It is the responsibility of the inspector to periodically sample all component materials and submit these samples to the Bureau of Materials & Physical Research for testing.

(a) Cement and Aggregates

Cement and aggregates shall have documentation as to their acceptance in the form of delivery tickets from an approved source. The producer shall keep this documentation on file so that the inspector can periodically review the documentation.

(b) Steel Reinforcement

Steel reinforcement shall be documented as to its acceptability by mill certification. This documentation shall be kept on file by the producer.

MATERIAL GROUP 475
CONCRETE PIPE & DRAIN TILE

Random samples shall be obtained and sent to the Bureau of Materials & Physical Research for testing.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications.)

(c) Components

The producer shall have copies of the manufacturer's certifications of quality and performance for rubber gaskets and for mastic concrete pipe joint sealer. The mastic concrete pipe joint sealer shall be randomly sampled.

Plant Requirements

Each producer must meet the following requirements.

(a) Testing Equipment

Each producer is required to have testing equipment, or have a source available, for performing three-edge bearing tests and a compression machine for testing cores and cylinders.

(b) Product Storage and Shipment

Each producer must have adequate and accessible storage in which to properly store the finished product awaiting inspection and/or shipment. The storage area should be free of mud and/or weeds and be arranged in such a manner as to permit the inspector freedom of access. When the concrete has attained the required strengths, but not prior to 4 days after casting, the units may be loaded, shipped, and used.

**MATERIAL GROUP 475
CONCRETE PIPE & DRAIN TILE**

Concrete Pipe

Physical Tests

(a) Strength Testing

Strength testing may be performed either by a three-edge bearing test or by compression testing of cores from selected pieces of pipe or cylinders made from mix. Bearing tests are normally performed on smaller pipe. Larger pipe are usually testing by compression tests of cores taken from the pipe. Either one of these methods should be utilized for testing machine-made pipe. On the other hand, concrete cylinders are made for strength tests on pipe made by the wet cast method.

(b) Absorption Testing

Absorption tests are to be performed periodically on concrete pipe. These tests are made on cores taken from machine-made pipe and may be made on test cubes in conjunction with wet cast pipe.

One good method of selecting pieces of machine-made pipe to core for absorption samples is to pick a piece that best represents the pipe in the stockpile. Water marking leaves a dendritic effect on the outside of the pipe when the mold (forms) is removed. The presence of water marking is a good indication of proper water content in the mixture. A lack of water marking is an indication that the pipe may be lacking in adequate density and subsequently exhibit high absorption.

MATERIAL GROUP 475 CONCRETE PIPE & DRAIN TILE

Visual Inspection

During the visual inspection phase, the inspector shall check each piece of pipe for the following features.

(a) Physical Characteristics

(1) Identification Marks

Identification marks shall be either painted or stamped in the barrel with waterproof marking on wet cast pipe and engraved in the barrel for dry mix pipe. If the identification marks are absent, there is no need to check the pipe for other features; it is simply rejected. A typical example of the following markings may be: "C-76-IV, [producer name] 5/21/96". (See Figure 26 in Appendix B herein.)

- Class of pipe
- Name or trademark of producer
- Identification of the plant (such as plant number)
- Date of Manufacture
- Pipe with quadrant reinforcement shall be marked with the letter "A".

(2) Physical Measurements

- Internal pipe diameter (Tolerances are specified in the appropriate ASTM or AASHTO specification.)
- Length of pipe (Tolerances are specified in the appropriate ASTM or AASHTO specification.)
- Wall thickness (Tolerances are specified in the appropriate ASTM or AASHTO specification.)
- Straightness in the case of non-reinforced pipe (All tolerances are specified in the appropriate ASTM or AASHTO specification.)

MATERIAL GROUP 475
CONCRETE PIPE & DRAIN TILE

(b) Defects

In addition to checking the pipe for the above features, each piece is checked for the following defects or impairments during the visual inspection phase.

(1) Improper Reinforcement Placement

A thin layer of concrete over the steel may be evidenced by ghosting. Further inspection may be necessary to determine the proper depth of cover as stated in the appropriate specification. The exposure of ends of longitudinal steel, stirrups, lift holes, or spacers used to position the reinforcement (cages) during placement of the concrete is not considered a defect or cause for rejection. (See Figures 18, 19, 20, 21 and 22 in Appendix B herein.) Any other exposed steel is considered a defect and is rejected.

(2) Chipped or Damaged Ends

This is considered cause for rejection if the damage is halfway or more into the joint and has a length of more than 10 percent of the end circumference. Small chips may be properly patched and accepted. Patching shall be performed by the manufacturer only when authorized by the Engineer and shall be done according to the procedures described in Appendix A. (See Figures 7, 8, 12, 13, 14, 16 and 24 in Appendix B herein.)

(3) Patching

Defects inside or outside the barrel may also be patched provided the cross-sectional area of the patch does not exceed 2 percent of the cross-sectional area of the pipe and 1/2 percent of the surface area of the pipe. No more than one patch per piece of pipe is permitted. All patching shall be done according to and with the pipe manufacturer's approved methods and patching materials.

MATERIAL GROUP 475
CONCRETE PIPE & DRAIN TILE

(4) Cracks or Fractures

These are considered cause for rejection if they pass through the wall. A single end crack that does not extend into the barrel of the pipe is not a cause for rejection. Any crack having a surface width of 0.3 mm (0.01 in.) or more and more than 300 mm (12 in.) in length, regardless of position in the wall, is considered cause for rejection. (See Figures 1, 2, 3, 4, and 23 in Appendix B herein.)

(5) Out-of-round

Out-of-round (not of uniform diameter) pipe is cause for rejection. (See Figure 17 in Appendix B herein.)

(6) Honeycomb

If it is not deeper than $\frac{3}{4}$ of the depth of the coarse aggregate and does not exceed 5 percent of the circumferential area of the pipe, it may be considered acceptable. (See Figure 15 in Appendix B herein.) However, no pipe is acceptable if the honeycomb is on the inside of the pipe.

(7) Barrel Roughness

The inside of the pipe should be substantially free from surface roughness.

(8) Overpacking

This is evidenced by excess material being present in the bell end due to its being shoved past the end of the barrel during production. A small amount is not cause for rejection. However, if a lamination occurs, the pipe shall be rejected. (See Figures 9, 10, and 11 in Appendix B herein.)

**MATERIAL GROUP 475
CONCRETE PIPE & DRAIN TILE**

(c) Rejection

To assist the inspector in making decisions during the visual inspection phase, a number of photographs illustrating various reasons for rejection have been included in Appendix B herein.

Each example is identified with an appropriate caption. In some of the illustrations the defect shown is not sufficient cause for rejection and is identified accordingly. Below is a tabular summary of reasons for rejection, most of which are illustrated in Appendix B.

<i>Cause for Rejection</i>	<i>Possible Repair</i>
Fail physical test requirements	None
Absence of required markings	None
Chipped or broken ends	Patch if not too large
Excessive overpacking/feather edge	None
Improper reinforcement placement	None
Excessive honeycomb	None
Insufficient wall thickness	None

<i>Cause for Rejection</i>	<i>Possible Repair</i>
Poor workmanship (roughness, etc.)	None
Improper diameter or length	None
Out-of-round	None
Excessive cracks or fractures	None

Evidence of Acceptance

Refer to the Bureau of Materials & Physical Research Policy Memorandum "Concrete Pipe Plant Certification Procedure" for requirements of Certified Plants. Certified Plant producers will be stamping the pipe with the word "CERTIFIED". However, pipe from a De-Certified Plant will be inspected, tested, and stamped "ILL OK" by an IDOT inspector. Each piece should be stamped on one end. Pipe with diameter larger than 18" should be stamped in two or more places. The stamp serves as evidence of inspection. Shipment is followed with an inspection report.

MATERIAL GROUP 475 CONCRETE PIPE & DRAIN TILE

Final acceptance is completed with a visual inspection at the job site for defects and damage.

Methods of Production

There are presently four methods of pipe manufacturing being utilized by producers furnishing pipe to the State of Illinois. These methods are identified as packer head, vibratory, tamper bar, and wet cast.

(a) Packer Head

The packer head process utilizes a hydraulic press system to compact the concrete mixture in the pipe molds in conjunction with a rotating table which permits finishing the interior of the pipe. Two of the more common potential problems with this method of production are the failure of the operator to use the proper amount of water in finishing the pipe and "overpacking" of the bell end which is discussed in Article 475.2.2(b)(8) herein.

(b) Vibratory Process

The vibratory process employs vibration and rotation to compact the mixture and finish the pipe. A potential problem with this method is the finished pipe being out-of-round due to too much water in the mix.

(c) Tamper Bar

This method utilizes a tamper bar inside the molds (forms) to compact the mixture in conjunction with rotation. The operator can vary the speed and pressure of the tamper bar in making the pipe. A potential problem with this method is displacement of the reinforcing cage by the tamper bar.

(d) Wet Cast

The wet cast method simply consists of placing plastic concrete in the pipe molds in much the same manner as a cast-in-place item would be made. This method is often employed on larger pieces of specialty items discussed later herein. A potential problem with the wet cast method is lack of proper consolidation which may result in honeycomb.

**MATERIAL GROUP 475
CONCRETE PIPE & DRAIN TILE**

Concrete Drain Tile

Physical Tests

(a) Strength Testing

External crushing strength tests are required by the three-edge bearing method. When the concrete has attained the desired strength, but not prior to 4 days after casting, the units may be shipped. Refer to Article 1040.06 of the Standard Specifications.

MATERIAL GROUP 490 PLASTICS

Inspection Procedures

Plastic products covered in this material group encompass a wide variety of materials made of natural or synthetic organic compounds. These compounds are united through a process called "polymerization". The material can subsequently be molded, extruded, or cast into various shapes and forms, or drawn into filaments for use as a textile fiber.

Inspection standards for the acceptance of these products are covered in the applicable sections of AASHTO and ASTM specifications; the Standard Specifications; and the contract plans and/or special provisions.

Part 2 (Material Codes, Specifications, and Acceptance Methods) herein lists the size and frequency for the test specimen sampling of these products.

Plastic Pipe

This article covers a variety of plastic pipe made from polyvinyl chloride (PVC) and from polyethylene (PE) according to various AASHTO or ASTM specifications. The specific AASHTO or ASTM listings and additional IDOT specifications can be found in Section 1040 of the Standard Specifications.

Acceptance for all PE and PVC pipe products requires samples to be tested by the Bureau of Materials & Physical Research for strength and deflection. Samples are usually taken by district personnel at the producer, supplier, or job site. These samples should be tested in the same construction season in which the products are installed.

Many of these products also have specifications for cell classification. The cell classification, along with manufacturer's name or trademark, size, and ASTM or AASHTO designation, is required to be on all PVC pipe.

The uses for these products include pipe drains, pipe underdrains, pipe culverts, storm sewer, backslope drains, culvert liners, and water main. Care should be taken to assure that the proper product is used for the specific application. Information on application can be found in the *Standard Specifications for Water &*

MATERIAL GROUP 490 PLASTICS

Sewer Main Construction in Illinois, the appropriate section of the IDOT Standard Specifications, special provisions, and Bureau of Design & Environment Policy Memorandum "Pipe Culverts and Storm Sewer".

Geotextile Fabrics

Products under this heading include woven, nonwoven, and knitted fabrics made from polypropylene, nylon, polyethylene, and polyester. These fabrics are specified for various types of construction operations or pay items, and, as such, specifications denote the weight and strength of material required for a particular use. The inspector should know the intended use of the fabric material that is being inspected. Inspection consists of verification that the unit weight and performance data meets contract requirements. If unit weight cannot be verified, the material shall be sampled as directed in Part 2 herein.

Manhole Steps

The manufacturer shall certify that plastic manhole steps meet the provisions of AASHTO M 199 / ASTM C 478.

MATERIAL GROUP 500 CLAY PIPE & DRAIN TILE

Inspection Procedures

The inspection procedures for clay pipe consist of laboratory tests and visual inspection of the finished products. Information relative to specification requirements, sample sizes, and acceptance procedures is contained in the material group listing in Part 2 (Material Codes, Specifications, and Acceptance Methods) herein.

Clay Pipe

(a) Applicable Specifications

- Articles 1040.01 and 1040.02 of the Standard Specifications
- AASHTO M 65M (ASTM C 700M)

(b) Physical Tests

A minimum of two pieces shall be tested for crushing strength. The number of pieces tested shall not exceed 0.5 percent of the pipe furnished. If any specimen fails, two additional pieces will be tested for each failing test. If both retests pass, the material may be accepted.

(c) Absorption-Hydrostatic Pressure

Pipe should be tested for absorption or hydrostatic pressure at the producer's option.

Hydrostatic pressure tests shall be observed by the inspector. Absorption samples may be sent to the Bureau of Materials & Physical Research for tests.

**MATERIAL GROUP 500
CLAY PIPE & DRAIN TILE**

(d) Visual Inspection

Pipe shall be checked for the following:

- Out-of-round
- Size and dimensions
- Straightness
- Blisters
- Fractures and cracks
- Lack of glaze
- Markings

Drain Tile

(a) Applicable Specifications

- Article 1040.01 of the Standard Specifications
- AASHTO M 179M
- AASHTO T 33M

(b) Physical Tests

Tests shall be observed by the inspector, or samples shall be sent to the Bureau of Materials & Physical Research for tests.

(1) Strength

Five specimens shall be selected and tested for strength according to AASHTO T 33M.

(2) Absorption

Segments taken from each of the five tile broken in the strength tests shall be used for absorption tests.

**MATERIAL GROUP 500
CLAY PIPE & DRAIN TILE**

(c) Visual Inspection

Tile shall be checked for the following:

- Cracks
- Checks
- Chips
- Shape
- Presence of foreign minerals and chemicals

Drain tile in dry condition should give a clear ring when tapped lightly with a hammer.

MATERIAL GROUP 510 CAST IRON PIPE

Inspection Procedures

Acceptance of cast iron pipe is by manufacturer certification as well as visual inspection for condition and defects. Inspection is usually performed by IDOT District personnel at the shipping destination.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications.)

Cast Iron Water Pipe

Cast iron water pipe shall conform to Article 1006.19 of the IDOT Standard Specifications. This article references Federal Specification WW-P-421. This federal specification gives requirements, such as strength, pipe thickness, weights, etc., for different types of pipe. It also gives references to American National Standards Institute (ANSI A21) standards which are needed for specifications on lined pipes, joint materials, etc.

The listing of material codes, specifications, and acceptance methods is provided in Part 2 herein.

Cast Iron Soil Pipe

Cast pipe is made of gray cast iron produced by a method that provides control over chemical and physical properties. The cast pipe shall be sound, true to pattern, and of compact, close grain. The interior surface shall be reasonably smooth and free from defects which would make the pipe unfit for the use intended.

Cast iron soil pipe shall conform to Article 1006.20 of the Standard Specifications. This standard references Federal Specification WW-P-401 which in turn references ASTM A 74M which details physical and chemical requirements and dimensional tolerances. The specifications for a particular job are referenced in the contract plans and special provisions.

MATERIAL GROUP 520 CORRUGATED ALUMINUM PIPE

Inspection Procedures

The base metal for products included in this material group is sheet aluminum or structural aluminum plate.

Inspection standards for the production, fabrication, and subsequent acceptance of corrugated aluminum pipe, structural plate, and related accessories are covered in the applicable sections of the Standard Specifications, AASHTO and ASTM specifications, and the contract plans and/or special provisions. Primary specification references are as follows:

- AASHTO M 196M, "Corrugated Aluminum Alloy Culverts and Underdrains"
- AASHTO M 197M, "Clad Aluminum Alloy Sheets for Culverts and Underdrains"
- AASHTO M 219M, "Aluminum Alloy Structural Plate for Field Bolted Conduits"
- IDOT *Standard Specifications for Road & Bridge Construction* :
 - ⇒ Section 541, "Corrugated Structural Plate Drainage Structures"
 - ⇒ Section 542, "Pipe Culverts"
 - ⇒ Section 601, "Pipe Drains, Underdrains, and French Drains"
 - ⇒ Section 1006, "Metals"

Several photographs are included in Appendix D in Part 3 herein which illustrate defective fabrication results that may also apply to aluminum pipe products.

Corrugated Aluminum Pipe

The inspector shall be furnished an itemized listing indicating the sizes, length, gauges, special treatments when required, and accessories for all products that are requested to be inspected. The products must be easily accessible so that a complete visual and dimensional examination can be made.

MATERIAL GROUP 520
CORRUGATED ALUMINUM PIPE

Each approved product shall be stamped on the inside and outside of one end with an "ILL OK" stamp. An LA-15 may be issued for shipping with the bill of lading.

The following items are specific areas that the inspector should check during the inspection process and compare with the appropriate references.

(a) Markings

An identification stamp shall be every 0.6 to 1.5 m (2-5 ft.) on coiled sheet used in spiral corrugated pipe and on each sheet or plate used for annular pipe or structural plate products.

(b) Dimensions

(1) Thickness

Flat sheet material shall be measured at any point not less than 10 mm from an edge. Corrugated products are to be measured on the tangents of the corrugations. Assure gauge of metal conforms to the Standard Specifications type requirement for pipe size and use.

(2) Diameter

Diameter is measured on the inside crest of the corrugations. Circular pipe and reformed pipe arch tolerances are based on nominal diameters. Tolerances for plate pipe arches are governed by both the equivalent diameter and the corrugation size.

(3) Length

Length is measured as the net length of the finished product. The average length deficiency for pipe shipment shall not exceed one percent of lineal feet ordered.

**MATERIAL GROUP 520
CORRUGATED ALUMINUM PIPE**

(c) Corrugations

Corrugations shall form smooth, continuous curves; tangents may be either annular, spiral, or a combination of both. The Standard Specifications denote the corrugation sizes permitted for a specific diameter and type of pipe. The depth, pitch, and spacing of the corrugations should be checked along with the subsequent minimum lap width requirement of the finished product.

(d) Rivets

The location, size, and number of rivets per corrugation of the longitudinal seam are based on the sheet thickness, corrugation size, and the diameter of the pipe. Circumferential seam rivets shall be of the same size as for longitudinal seams with a maximum 150-mm (6-in.) spacing except that only six rivets will be required for 300-mm (12-in.) pipe.

(e) Lock Seams

For helically corrugated pipe, the lock seam shall be continuous from end to end of each pipe length, and lapped surfaces shall be in tight contact.

(f) Workmanship

The completed products shall show careful finished workmanship in all particulars. Under Material Group 450 herein, Article 450.1.1(h) lists several defects which indicate poor workmanship. These defects, except for spot welding or continuous seam welding which are not permitted for aluminum pipe, also apply in the fabrication of aluminum products. The presence of any or all of these defects in any individual item or, in general, in any shipment shall be sufficient cause for rejection.

Miscellaneous

(a) Coupling Bands

Specifications require that the bands shall provide sufficient strength to preserve alignment and to prevent pipe separation or soil infiltration. Bands shall be aluminum, but either aluminum- or zinc-coated steel may be used for

MATERIAL GROUP 520
CORRUGATED ALUMINUM PIPE

the fasteners of the connecting bands. The band may be three sheet thicknesses lighter than the pipe being connected but not less than 1.2 mm (0.048 in.). The widths and configurations for bands will vary depending on the diameter of pipe and the style or depth of corrugations. Bituminous coating for connecting bands is not required.

(b) Structural Plate Bolts

Plates of longitudinal and circumferential seams shall be staggered so that not more than three plates come together at one point. The bolt and nut assembly fasteners for aluminum plates may be either zinc-coated steel, aluminum-coated steel, or aluminum.

(c) Perforations

Perforations shall be approximately circular and clean-cut, have a nominal diameter in accordance with the Standard Specifications, and be arranged in rows parallel to the axis of the pipe. Perforations shall be located on the inside crest or along the neutral axis of the corrugations. The rows of perforations and their locations are based on the diameter of the pipe as indicated in AASHTO M 196M.

(d) End Finish

A reinforced end finish is not required on inlets nor outlets of corrugated aluminum pipe; however, when specified, it shall be finished in a satisfactory manner.

(e) Specialty Items

Special pipe or aluminum products not covered by specifications shall meet the requirements of the contract plans and/or special provisions. Data governing these specialty items should be furnished the fabricator so that the product can be properly constructed and subsequently inspected.

**MATERIAL GROUP 520
CORRUGATED ALUMINUM PIPE**

Handling

The field inspection made by the Engineer shall assure that damage has not occurred through carelessness in the loading, transporting, unloading, and delivering the finished product to the construction site and in its final installation. Appropriate methods of handling pipe products are described in Section 450.2 of Material Group 450 (Part 1) herein.

MATERIAL GROUP 540 BRIDGE RAIL

Inspection Procedures

The inspection procedures for bridge rail and accessories involves the securing of samples from the producer's or supplier's plant. The samples, along with a certificate of mill analysis, shall be forwarded to the Bureau of Materials & Physical Research for testing.

When the physical properties of the material are approved, a visual inspection is required at either the source or the job site. The inspector should take special note that the surfaces of the rail elements and posts have a uniform finish and are not tarnished, have no mottled areas or a gritty appearance. Dip marks or brush marks may not be cause for rejection. All galvanized rail, posts, and accessories should be checked for minimum coating thickness with a magnetic thickness gauge for compliance to AASHTO M 111M.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications.)

Railing

(a) Aluminum

Aluminum elliptical pipe railing (single rail and Type L) and aluminum circular top railing (Type L) shall conform to Article 1006.30(b) of the Standard Specifications and to ASTM B 211M.

(b) Galvanized Steel for Railings

Galvanized steel tube, posts, and accessories for bridge rail shall conform to Article 1006.34 of the Standard Specifications. Acceptance of galvanized steel for railings requires manufacturer's certification of each steel used in fabrication. The certification of the tubular steel shall include the results of Charpy V-notch (CVN) impact testing or drop-weight tear tests as specified in Article 1006.34(b).

Acceptance also requires a visual inspection of all galvanized pieces for the following:

MATERIAL GROUP 540 BRIDGE RAIL

- Warp or bulge
- Shipping damage
- Uniform finish
- "White rust"
- Thickness of the zinc coating

Items showing the appearance of "white rust" may be accepted if:

- the "white rust" is removed or neutralized,
- the coating thickness is not damaged, **and**
- the appearance of the item is satisfactory to the Engineer.

Post Railing

(a) Cast Aluminum

Cast aluminum post railing (single rail and Type L) shall conform to Article 1006.30(a) of the Standard Specifications and to AASHTO M 193M.

(b) Malleable Cast Iron

Malleable cast iron post railing (Type M) shall conform to Article 1006.16 of the Standard Specifications and to ASTM A 47M Grade No. 32510.

(c) Galvanized Steel I-Beam

Galvanized steel I-beam post railing (Types N, S, and T) shall conform to contract plans and to ASTM A 441-79.

Anchor Device

All types of anchor device railing shall conform to contract plans. Material shall be checked for dimensions and proper placement.

**MATERIAL GROUP 540
BRIDGE RAIL**

Documentation

The producer or supplier of all materials for bridge railing should provide a certificate of mill analysis as documentation for the IDOT inspector.

MATERIAL GROUP 550

GUARD RAIL

Inspection Procedures

Guard rail and traffic barrier terminals, including posts, bolts, hardware, and accessories, are accepted on the basis of manufacturer's certification and a visual inspection as detailed in this section.

Specifications and acceptance procedures for guard rail and terminal assemblies are covered in Sections 630 and 631 of the Standard Specifications, Highway Standards, special provisions, and supplemental specifications.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications.)

Guard Rail

(a) Visual Inspection and Approved Sources

The inspection process for guard rail shall consist of the contractor furnishing a certificate of mill analysis for the railing, posts, and other accessories and of performing visual inspection to verify compliance with the appropriate specifications for the aspects outlined below.

(1) Heat Number

Verify the heat numbers on the railing and posts with the heat numbers shown on the mill analysis.

(2) Physical Dimensions

Determine the physical dimensions of the railing and posts on random pieces including checking the gauge thickness with a micrometer.

(3) Weight of Galvanizing

Randomly check for the weight of the zinc coating with a magnetic-type gauge, such as a Tinsley or Mikro test gauge.

MATERIAL GROUP 550
GUARD RAIL

(4) Identification Markings

Verify the following identification markings are present on each piece of rail:

- Manufacturer's name
- Heat number
- AASHTO or ASTM specification
- Class of rail
- Type of zinc coating

(5) Condition of Galvanizing

If evidence of "white rust" (zinc oxide) is present, and visible pitting of the zinc coating has not occurred, the rail may be cleaned and accepted. If visible pitting of the coating has occurred, the material is unacceptable.

(6) Fasteners

Sample and submit specimens of bolts, nuts, and washers to the Bureau of Materials & Physical Research for testing; or secure certified laboratory test data for dimensions, tensile strength, proof load,

MATERIAL GROUP 550
GUARD RAIL

hardness, and weight of the zinc coating; or obtain certification of fasteners from the manufacturer.

(7) Workmanship

Check general workmanship for defects as described below:

- Blisters—caused by surface defects in steel or absorbed hydrogen
- Flux spots—stale flux burnt on during dipping or flux picked up from top of bath
- Inclusions—can be from ash burnt on during dipping, surface residues on steel, flux picked up from top of bath
- Dross—a scum formed on the surface of molten metal
- Flaking zinc coating or adherence capability—occurs during transportation, erection, and service (See ASTM A 123M for test.)
- Hair checking or bare spots—caused when steel has not been sufficiently cleaned before galvanizing

Failure to meet the requirements of the plans and specifications for physical dimensions or galvanized coating, the absence of the necessary mill analysis, or the presence of "white rust" pits or any workmanship defect shall be cause for rejection.

(b) Inspection of Material from Unapproved Sources

Inspection of guard rail, posts, and accessories originating from unapproved sources shall consist of visual inspection in the same manner as outlined above and of securing samples for testing by the Bureau of Materials & Physical Research as follows:

MATERIAL GROUP 550
GUARD RAIL

(1) Guard Rail and Accessories

One piece of guard rail, a back-up plate, one post, and one end or buffer section from each 200 pieces in a lot, or from each lot if less than 200 pieces are included therein, are required. (A lot is considered that quantity of material offered for inspection at one time which bears the same heat and coating identification.)

(2) Fasteners

Three samples of each size and manufacturer of bolts, nuts, and washers are required.

Timber Post

Timber posts for guard rail are to be in compliance with Article 1007.09 of the Standard Specifications.

Documentation

Documentation of guard rail is dependent upon the point of inspection. If at other than the job site, an LA-15 may be issued for the acceptable pieces to be shipped with the bill of lading. If inspected at the job site, the rejected pieces should be appropriately identified and the resident engineer notified.

MATERIAL GROUP 560 LANDSCAPE

Inspection Procedures

Landscaping and planting materials include seeds, fertilizers, sod, plants, shrubs, trees, mulches, and erosion control items. The inspection procedure for products in this category is variable and therefore will be described separately. Reference to Part 2 (Material Codes, Specifications, and Acceptance Methods) herein gives sample size and other information.

Fertilizer

Acceptance of fertilizers is on the basis of a visual inspection. The inspector should ascertain that the manufacturer's guaranteed analysis is stamped on the bag and that it is in conformance with the required analysis. In the case of bulk shipments, the producer must certify in writing as to the analysis, and the inspector in turn verify it is in compliance with the project requirements. Fertilizers are to meet the requirements of Article 1081.08 of the Standard Specifications.

Seeds

The sampling and testing of seeds shall be according to Article 1080.04 of the Standard Specifications. Briefly, this article states that seeds will be tested by an authorized laboratory, and the cost of the testing will be a part of the unit bid price. Acceptance of seeds under this specification will be based on receipt and approval of a certification covering tests from each lot of seed. The certification must be signed by a registered seed technologist. Lots older than 12 months shall be recertified. Seeds may be sampled at destination on a random basis for comparison with the certification and for compliance to the specifications.

Plants, Trees, and Shrubs

Plants, trees, and shrubs are to be visually inspected for compliance with Articles 1080.01 and 1081.02 of the Standard Specifications. Trees and shrubs are to be checked for height and/or diameter in accordance with the project provisions. In addition, the spread of the root system for bare-root plants

MATERIAL GROUP 560 LANDSCAPE

should be checked just as the size of the ball should be checked on balled and burlapped plants.

Sod

Sod is to be visually inspected for compliance with the requirements of Article 1081.03 of the Standard Specifications. Quite often this inspection may be made by the district landscape architect. Sources of sod are subject to inspection by the Illinois Department of Transportation. Each shipment is to be accompanied by an inspection certificate.

Peat Moss

Peat moss is to be sampled and tested for compliance with the requirements of Article 1081.09 of the Standard Specifications. At the time of sampling, the inspector should ascertain that the peat moss is packed in bales and that each bale is marked with the following information.

- Type of peat moss
- Brand name
- Country of origin
- Cubic feet compressed size
- Compression ratio used
- Approximate bale weight

In the absence of such marking, each shipment must be accompanied by a certificate stating the above information.

Special Erosion Control Material

Erosion control items, such as excelsior blanket, knitted straw mat, staples, stakes, and fiber mat, are covered in Article 1081.10 of the Standard Specifications. Inspection of these items consists of visual examination of the products for condition and verification from the label or certification that they meet specifications. If compliance cannot be verified, the material shall be sampled as indicated in Part 2 herein.

**MATERIAL GROUP 560
LANDSCAPE**

Top Soil

Top soil is to be sampled and tested for compliance with article 1081.05 of the Standard Specifications.

Mulch Materials

Mulch materials for seeding shall be in compliance with article 1081.06(a), and those of planting shall be in compliance with article 1081.06(b) of the Standard Specifications.

MATERIAL GROUP 575 FENCING

Inspection Procedures

Fencing materials under this material group include chain link and woven wire products such as wire, fabric, fasteners, posts, braces, etc. Inspection primarily involves visual inspection. The inspector should verify class and coating from manufacturer's tag or label. If the label is not available, a sample should be taken as indicated in Part 2 (Material Codes, Specifications, and Acceptance Methods) herein.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications states).

Chain Link Fence

The fabric, metal posts and braces, gates, tension wire, fabric ties, bolts and nuts, and fittings shall meet the requirements of Article 1006.27 of the Standard Specifications and the contract plans.

Woven Wire Fence

The woven wire, barbed wire, metal posts and braces, gate frames, post tops, and miscellaneous materials shall meet the requirements of Article 1006.28 of the Standard Specifications and the contract plans.

MATERIAL GROUP 600 SIGNING

Inspection Procedures

There are numerous products in the category of signing materials. Items may be accepted by visual inspection; certification; and some items require samples to be submitted to the Bureau of Materials & Physical Research for testing, or tests may be performed by the producer and witnessed by the inspector. In the case of overhead sign trusses, component materials are sampled for testing, but fabrication inspection is performed by the Bureau of Bridges & Structures.

Due to the different items, there are also numerous different specification sources. The majority of the specifications are in the Standard Specifications. However, the Bureau of Materials & Physical Research "M" specifications and IDOT special provisions are additional sources. Reference to Part 2 (Material Codes, Specifications, and Acceptance Methods) herein will provide basic inspection and sampling procedures.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications.)

MATERIAL GROUP 615
JOINT FILLERS & SEALERS & EXPANSION DEVICES

Inspection Procedures

Products in this material group include various joint fillers, joint sealers, and neoprene expansion joints. Some products in this group may be accepted by manufacturer's compliance to the requirements of the Standard Specifications and special provisions. Others require testing by the Bureau of Materials & Physical Research. See Part 2 herein for specific acceptance methods, samples sizes, and sampling frequencies.

Preformed Joint Fillers and Sealers

These materials cover a wide range of asphalt, cork, plastic, or foam products that are used as preformed joint fillers or sealers. These materials shall conform to Section 1051 of the Standard Specifications.

Nonpreformed Joint Fillers and Sealers

These materials include the bituminous-based crack fillers, poured joint fillers, and trowelable mastics and shall conform to Section 1050 of the Standard Specifications.

Expansion Joints (Neoprene and EPDM) and Neoprene Joint Sealers

Neoprene expansion joints and joint sealers are accepted on the basis of "lot" samples submitted by the manufacturer or fabricator to the Bureau of Materials & Physical Research. The approved lot numbers are available in the MISTIC system or by contacting the Bureau of Materials & Physical Research. These materials shall conform to Sections 1052 and 1053 of the Standard Specifications.

If it is determined that the lot has not been tested, the lot shall be sampled according to Part 2 herein.

MATERIAL GROUP 625 REINFORCING STEEL

Inspection Procedures

Reinforcement bars, dowel bars, and welded wire reinforcement have similar acceptance procedures. When reinforcing steel is field inspected, the inspector should be very familiar with the IDOT specification, the ASTM/AASHTO reference specifications, and the QC or Certification program under which the material is manufactured. Also, Several Bureau of Materials and Physical Research policies and approved lists apply to these products and are available on the IDOT Doing Business web page.

Policy Memoranda

- "Reinforcement Bar and/or Dowel Bar Plant Certification Procedure"
- "Reinforcement Fabric Plant Certification Procedure"

Approved lists

- "Epoxy Coatings for Steel Reinforcement" **[Will be deleted as CRSI requires certification and record keeping]**
- "Mechanical Reinforcing Bar Splicers/Coupler Systems"
- "Reinforcing Bar and/or Dowel Bar Producers"
- "Welded Wire Reinforcement Fabric Producers"

Applicable Standard Specification References

- | | | |
|----------------|---|---|
| • Art. 508 | Reinforcement Bars | Installation and handling of reinforcing and ECR |
| • Art. 442.02 | Pavement Patching | Dowel Bar reference spec for Class B Patches
Note: After 1/1/2003, all dowel bars must be epoxy coated by special provision |
| • Art. 1006.10 | Concrete Reinforcing Bars, Fabric, and Strand | Materials specification |
| • Art. 1006.11 | Pavement Longitudinal Metal Joints , Dowel Bars, Expansion Joint Assembly, and Contraction Joint Assembly | Materials specification |
| • BSD-1 | Bar Splicer Assembly Details | <u>Notes</u> include test requirements for bar splicer assemblies |

MATERIAL GROUP 625 REINFORCING STEEL

NOTE: The Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications.)

Source Inspection – While not required, districts may inspect this material at the source for their own convenience. Inspectors that perform source inspection should keep in mind that the producer is responsible to IDOT to follow certification or QC programs. If there are quality problems, the inspector should review the producer's QC Plan to help determine the source of the problem. Lot testing may be used as a last resort when delivery is critical.

Reinforcement Bars and Dowel Bars

Concrete reinforcing steel is under a certification program administered by BMPR. Acceptance is based on proper markings, verification that the producer is on the approved list, and random samples.

Visual Inspection - The inspector should examine the bars to determine the grade, size, and "brand" markings. The approved list contains the known markings for producers under the IDOT certification program.

Random sampling and testing – To monitor the certification program and validate the quality of material, each District shall take random samples for BMPR testing. Each construction season, each district shall take a minimum of 6 random samples from material supplied by each Certified Producer plant supplying material to that District and assigned to or designated for a State job. The samples shall include as many grades and sizes as are available. The samples shall be taken from different shipments and may be taken at the jobsite, the fabricator, the warehouse, or any other location approved by the Engineer. The heat traceable samples shall be sent to the BMPR laboratory for testing.

MATERIAL GROUP 625 REINFORCING STEEL

Epoxy-coated Reinforcement Bars and Dowel Bars

The requirements for accepting epoxy coated steel are the same as described for black bar, plus the following:

Effective with the April 25, 2003 Letting, Epoxy-coated reinforcement bars and pavement dowel bars must be coated by producers that are in good standing in the CRSI Epoxy Coating Certification Program. The inspector should be familiar with the CRSI program. A 3-ring bound manual and informational CD are available from CRSI. BMPR can also provide a floppy disc copy of the model QC program, upon request.

Acceptance of the coating is based on participation in the CRSI program, visual inspection, random field tests, and random BMPR tests.

Specification - The governing material specs are Articles 1006.10 and 1006.11. Other requirements, in addition to AASHTO M 284 , M 227, and the CRSI Certification Program include:

- The maximum coating thickness for spiral reinforcement, coated after fabrication, is 0.5 mm (20 mils).
- For continuity of coating, no more than eight of the holidays permitted shall be in any 300-mm (1-ft.) length.
- Bars may be cut or sheared (not flame cut) after coating. (Dowels may not be sheared)

Material – Reinforcing steel and dowel bars shall be obtained from IDOT Certified producers. The epoxy powder must be approved per M 284. This is also a requirement of the CRSI certification program. (IDOT will probably drop its own approval list for Powder.)

Acceptance – The inspector must have a bill of lading or other evidence that the bar was coated by a CRSI Certified plant. Suspected violations of the CRSI Certification program should be reported to the BMPR. BMPR will investigate and coordinate any feedback to CRSI.

MATERIAL GROUP 625 REINFORCING STEEL

Visual Inspection – Because of the potential for damage to the coating, IDOT Inspectors should regularly inspect jobsite material.

Random Source and Jobsite Verification – Inspectors should regularly verify thickness of coating, holidays (determined prior to shipment), cracks in the epoxy on the bends, and other damaged areas. Inspectors should inspect for proper repair when applicable.

Recommended minimum random testing frequency:

- Source Inspection– Sample and test at least two deformed bar sizes and/or dowel bars during each visit. Or, witness QC tests. Once per month, submit (for at least two deformed bar sizes and/or dowel bars) samples for BMPR testing.
- Jobsite Inspection – Submit at least one set of heat traceable rebar and dowel bar samples from each coater per district per construction season. Splice bars shall not be used for test samples.

ECR Repair - All repairs must be according to Article 508.04 and ASTM D 3693. Patching material must be recommended by the powder coating manufacturer and supplied by the coater. Repair of damaged coating shall be done in accordance with the patching material manufacturer's written recommendations.

BMPR is not aware of any one-part or spray-on material that will comply with these specifications.

Bar Splicers (Couplers)

Mechanical reinforcing bar splicers or couplers must be one of the systems on the current approved list published by the BMPR. If there are more than 100 couplers on a project, acceptance is also contingent on testing by the Bureau of Materials and Physical Research. Installation procedures and equipment should be according to the manufactures' written instructions.

Sampling and Testing – Samples shall be taken and sent to BMPR for testing if there are more than 100 couplers on a project. If test samples are fabricated, they should be assembled with the equipment, technique and conditions representative of the job site.

MATERIAL GROUP 625 REINFORCING STEEL

Welded Wire Reinforcement

Welded wire reinforcing steel is under a certification program administered by BMPR. Acceptance is based on verification that the producer is on the approved list, and traceable random samples. Inspection procedures for reinforcement mesh consist of a visual inspection of each shipment to verify that:

- The manufacturer is a Certified Plant that is on the approved list.
- Each bundle is identified by an attached Tag or other documentation identifying the source.
- The mesh has proper spacing and wire size
- The wire is not damaged and welds are not broken (see M 255 for damage allowance)

Random samples - To monitor the certification program and validate the quality of material, each District shall take traceable random samples for BMPR testing. Each year, each District shall take a minimum of six (6) random samples from materials supplied by each Certified Plant supplying material to that District and assigned to or designated for a State job. The samples shall include as many sizes as are available. The samples shall be taken from different shipments and may be taken at the job site, the fabricator, the warehouse, or any other location approved by the Engineer. The samples shall be sent to the BMPR laboratory for testing.

Concrete Pavement Joint Assemblies

Expansion and contraction joint assemblies are covered in Article 1006.11 of the Standard Specifications.

The inspection of these assemblies consists of verifying that the bars are from certified reinforcement bar or dowel bar producers and that the welded assembly is approved and meets the Highway Standards. Configurations that have not been previously approved must be submitted to BMPR for approval.

MATERIAL GROUP 650 STRUCTURAL STEEL

Inspection Procedures

Structural steel shall meet the provisions of Article 1006.04 of the Standard Specifications, special provisions, and plan notes.

The inspection of fasteners, nuts, bolts, washers, etc., used in bridge construction is included in this material group.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications.)

Structural Steel

Most structural steel is furnished by fabrication companies which fabricate steel plates and shapes into members used in structures.

(a) Fabrication Inspection

Fabrication of structural steel is the responsibility of representatives of the Bureau of Bridges & Structures.

(b) Documentation

The mill will provide the inspector with copies of their chemical and physical tests. Upon satisfactory completion of the fabrication, the inspector issues a BBS-59, "Structural Steel Fabrication Report." Copies are sent to the Resident Engineer and the District Materials office.

Fasteners

Fasteners are usually sampled by manufacturing lots with specimens submitted to the Bureau of Materials & Physical Research for testing for compliance with the appropriate specifications. The point of sampling may be at the producer, supplier, fabricator, or job site. In most instances, three samples of each size and manufacturer are required.

MATERIAL GROUP 650 STRUCTURAL STEEL

(a) Inspection

In general, the inspection process for fasteners is as follows.

(1) Sample Selection

Samples are taken at one of the following:

- Manufacturer
- Supplier, fabricator, or job site if no evidence of prior inspection

The inspector goes to the appropriate source and selects three pieces of each lot, diameter, length, and manufacturer.

(2) Verification of Markings

The manufacturer's markings must be identified before samples are submitted for testing. This can be accomplished by checking illustrations provided in the "Guide for Identification of Fasteners". If a fastener cannot be identified, the Bureau of Materials & Physical Research should be contacted.

(3) Shipment of Samples

The samples, after identification and proper packaging, are sent to the Bureau of Materials & Physical Research for testing.

Refer to Part 2 (Material Codes, Specifications, and Acceptance Methods) herein for further information regarding special provisions, contract plans, or IDOT Standard Specifications on fasteners.

MATERIAL GROUP 675 MISCELLANEOUS STEEL

Inspection Procedures

The inspection process for miscellaneous steel may require samples. Mill certification furnished by the producer or supplier are required for most items. The samples are forwarded to the Bureau of Materials & Physical Research for testing. The material frequently is inspected at the source before shipment to a project.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications).

Fasteners

See Material Group 650, Article 650.1.2 herein.

Miscellaneous or Special Items

Refer to Part 2 (Material Codes, Specifications, and Acceptance Methods) herein for further information regarding special provisions, contract plans, or IDOT Standard Specifications on fasteners and miscellaneous or special items.

Documentation

The producer or supplier of miscellaneous steel items shall provide certified mill analysis as documentation.

MATERIAL GROUP 700 MISCELLANEOUS MATERIALS

Inspection Procedures

This material group represents a broad and diversified categorization of materials; however, they may require sampling and/or inspection. Reference to Part 2 (Material Codes, Specifications, and Acceptance Methods) herein will provide basic inspection and sampling procedures.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications states.)

Curing Blankets

Curing blankets include those products manufactured from burlap, burlap and polyethylene, waterproof paper, or polyethylene. Inspection requires that these products meet Section 1022 of the Standard Specifications to the satisfaction of the Engineer.

Bridge Bearing Pads and Related Items

Elastomeric bearing pads and pot bearings are accepted by letter of approval from the Bureau of Materials and Physical Research.

(a) Elastomeric Bearing Pad, Type I

If a pad is to be sampled for testing, the Bureau of Materials & Physical Research will notify the pad manufacturer and the involved district. One extra pad may then be sent to the job site or supplier. The inspector shall pick one pad at random and send it to the Bureau of Materials & Physical Research for testing.

(b) Elastomeric Bearing Pad, Types II and III

The sampling procedure is the same as for the Type I bearing; however, the manufacturer will also supply samples of rubber, teflon, and stainless steel from the same lots as used in the bearing to the Bureau of Materials & Physical Research.

The top steel plate and the bottom steel plate on the Type II and Type III bearings shall be attached to the rubber during the vulcanizing process. A

MATERIAL GROUP 700
MISCELLANEOUS MATERIALS

bonding epoxy is not permitted to attach the steel plates. The inspector shall visually check tests pads for evidence of extrusions of epoxy.

The elastomeric bearing pads are subject to the requirements of Section 1083 of Standard Specifications.

(c) Pot Bearing

The sampling procedure for the pot bearing is the same as for the Type I bearing; however, the manufacturer will also supply samples of rubber and teflon from the same lots as used in the bearing to the Bureau of Materials & Physical Research. The rubber and teflon are subject to the requirements of Section 1083 of the Standard Specifications.

(d) Neoprene and Natural Rubber Sheets

These are components of the Types I, II, and III elastomeric pads and the pot bearing. A minimum of 152 mm x 152 mm sample from the same lot of the bearing is required and shall meet specifications under Section 1083 of the Standard Specifications.

(e) Teflon (TFE)

The teflon sheet shall consist of pure TFE resin and shall meet the requirements of Article 1083.03 of the Standard Specifications.

(f) Stainless Steel Sheets

The stainless steel shall meet the requirements of Article 1083.04 of the Standard Specifications.

(g) Neoprene Bearing Pads

Neoprene bearing pads are to meet the requirements of AASHTO *Standard Specifications for Highway Bridges*, Section 25, Table B.

**MATERIAL GROUP 700
MISCELLANEOUS MATERIALS**

(h) Fabric Bearing Pads

Fabric bearing pads shall consist of a fabric and rubber body made with new unvulcanized rubber and unused fabric fibers.

Brick (Clay or Shale)

(a) Facing

Facing brick made from clay, shale, fire clay, or mixtures thereof and fired to incipient fusion are specified in ASTM C 216M. The inspector should refer to this specification as visual inspection is critical for color, cracks, chips, size, and warpage.

(b) Sewer and Building

Sewer brick made from clay or shale and burned and intended for use in (1) drainage structures for the conveyance of sewage, industrial wastes, and storm water, and (2) structures such as manholes and catch basins are specified in ASTM C 32M.

Building brick made from clay and shale and burned and intended for use in brick masonry are specified in Article 1041.01 of the Standard Specifications and in AASHTO M 114M.

The bricks shall conform by visual inspection to the requirements in the plans and to the samples passing physical requirements. Minor indentations and surface cracks incidental to manufacturing, or small chipping resulting from handling, should not be cause for rejection.

MATERIAL GROUP 700 MISCELLANEOUS MATERIALS

Pavement Tape and Markings

(a) Pavement Marking Tape

Requirements for pavement marking tape are specified in Section 1095 of the Standard Specifications. Acceptance is based on samples taken by district personnel and tested by the Bureau of Materials & Physical Research. Sample sizes and frequencies of submittal are given in Part 2 (Material Codes, Specifications, and Acceptance Methods) herein.

(b) Preformed Plastic Pavement Marking

Preformed plastic pavement marking shall meet the provisions of Article 1095.03 of the Standard Specifications. Preformed plastic line is sampled at the producer by the Bureau of Materials & Physical Research. A printout of approved lots is issued weekly to each District Materials office. Acceptance is based on approved lots. Preformed plastic letters and symbols are accepted by manufacturer's certification.

(c) Thermoplastic Pavement Markings

Thermoplastic pavement markings shall meet the provisions of Article 1095.01 of the Standard Specifications. Each lot or batch of thermoplastic and glass beads is sampled at the production facility and tested by the Bureau of Materials & Physical Research. A printout of approved lots is issued to each District Materials office. Acceptance is based on approved lots or batches.

Other Items

Items such as fire hydrants, impact barriers, and stone block are specified under special provisions or plans. The inspector should check for quality and dimensions

MATERIAL GROUP 775 MISCELLANEOUS METALS

Inspection Procedures

Because of the wide range of materials in this material group, it is important to have specific information regarding the description of the item. The material group listing in Part 2 (Material Codes, Specifications, and Acceptance Methods) herein will give some information. In addition, for many items it may be necessary to have access to a copy of one or more of the following:

- Contract plans
- Special provisions
- Specifications from various IDOT bureaus
- Highway standards
- ASTM and AASHTO standards

NOTE: Domestic Steel Products Act applies. (See Article 106.01 of the Standard Specifications.)

Aluminum Traffic Control Items

The following items shall conform to ASTM B 211M, Alloy 2024-T4. This is specified in the IDOT Standard Specifications.

- Aluminum hex head bolts
- Aluminum round head bolts
- Aluminum breakaway support couplings
- Aluminum hex nuts
- Aluminum washers

**MATERIAL GROUP 775
MISCELLANEOUS METALS**

Nonferrous Tubing, Fittings, and Plates

(a) Copper Water Tube

Seamless copper water tube is suitable for general plumbing and similar applications for the conveyance of fluids. The tube may be furnished in either coiled or straight lengths. The requirements for this material are covered in ASTM B 88M, Type K.

Acceptance of copper water tubing is by visual inspection for condition and to verify type k and the manufacturer. The type and manufacturer are stamped into the pipe at 1' intervals.

(b) Red Brass Pipe

This material is a seamless pipe that is produced in accordance with ASTM B 43M in all standard pipe sizes. It is rigid in form and is supplied in lengths, not coils. The wall thickness is approximately twice that of copper water tube.

(c) Brass Valve Corporation Stops

(d) Bronze Bearing Plates

The bronze bearing plates shall meet the requirements of Article 1006.21 of the Standard Specifications. These bronze plates are used in contact with hardened steel plates for bridge expansion bearings.

(e) Bronze Castings

The bronze casting shall conform to the requirements given in the contract plans or special provisions.

(f) Lead Plates

Lead plates shall meet the requirements of Article 1006.23 of the Standard Specifications. These lead plates, which are used primarily between the bottom steel bearing plate and top of the concrete bridge pier and abutments, compensate for the unevenness of the concrete.

**MATERIAL GROUP 775
MISCELLANEOUS METALS**

(g) Name Plates

Name plates shall meet the requirements of Section 515 of the Standard Specifications. Examples of possible cause for rejection are as follows:

- Poorly formed letters
- Lettering correctness, alignment, spacing, height
- Overall dimensions
- Length of lugs (if present)

Acceptance is by visual inspection by district personnel.

Markers

(a) Survey Markers

A survey marker is a mushroom-shaped object approximately 83 mm (3 1/4 in.) in diameter on top with approximately a 75-mm (3 in.) tapered stem. The marker shall conform to IDOT Highway Standard.

(b) Other Markers

The following items shall meet the requirements of special provisions or contract plans. The inspector should check for quality and dimensions. Examples of possible cause for rejection are the same as for name plates (Article 775.1.2[g] herein).

- Monument markers
- Section markers
- Brass (monument/survey) covers
- Stainless steel bench markers

**MATERIAL GROUP 775
MISCELLANEOUS METALS**

Aluminum Truss Welds

Before a materials inspector goes to inspect aluminum truss welds, it is necessary to discuss with his supervisor the exact details of the required inspection. The area of weld evaluation is a highly specialized area and should be coordinated by an experienced person in the Bureau of Bridges & Structures.

Other Items

Items such as aluminum drains, mud jack cylinders, and galvanized steel pipe saddles are specified under special provisions or contract plans. The inspector should check for quality and dimensions.

MATERIAL GROUP 800
MISCELLANEOUS MAINTENANCE MATERIALS

Inspection Procedures

The majority of items in this material group are covered in the Bureau of Materials & Physical Research "M" Specifications. Reference to Part 2 (Material Codes, Specifications, and Acceptance Methods) herein will provide basic inspection and sampling procedures.

NOTE: Domestic Steel Product Act applies. (See Article 106.01 of the Standard Specifications states.)